

NON-PUBLIC?: N
ACCESSION #: 8904200281
LICENSEE EVENT REPORT (LER)

FACILITY NAME: McGuire Nuclear Station, Unit 2 PAGE: 1 OF 6

DOCKET NUMBER: 05000370

TITLE: Reactor Trip on "B" S/G Lo-lo Level Following Loss Of 2B CFPT Because
OF Equipment Failure Of 2 Out 3 Suction Pressure Switches.
EVENT DATE: 03/14/89 LER #: 89-002-00 REPORT DATE: 04/13/89

OPERATING MODE: 1 POWER LEVEL: 098

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: Allan Sipe, McGuire Review Group TELEPHONE: (704) 875-4183

COMPONENT FAILURE DESCRIPTION:

CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE TO NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On March 14, 1989 at 0412, the Unit 2 Train B Main Feedwater Pump Turbine (CFPT) tripped. A Unit 2 Runback resulted because of the loss of the 2B CFPT. Operations personnel implemented procedure AP/2/A/5500/03, Load Rejection, and had completed all immediate actions when valve 2CM-420, Generator Load Rejection Bypass, failed to open as required on a runback signal. The failure of valve 2CM-420 to open prevented additional suction flow to be provided for the 2A CFPT, and consequently, levels in B and C Steam Generators (SGs) began to decrease. At 0415, the Unit 2 Reactor tripped because of a low-low level in 2B SG. The Main Turbine tripped because of the Reactor Trip. All three Auxiliary Feedwater pumps automatically started as required to recover SG levels. Unit 2 was in Mode 1, Power Operation, at 98% power at the time this incident occurred. This event has been assigned a cause of Other, Equipment Failure/Malfunction because of a failure of suction pressure switches on 2B CFPT and a broken air supply line to valve 2CM-420.

END OF ABSTRACT

EVALUATION:

Background

The Main Feedwater (CF) system EIIS:SJ! takes the treated Condensate system EIIS:SD! water, heats it further to improve the plant's thermal cycle efficiency, and delivers it at the required flow rate, pressure, and temperature to the SGs EIIS:SG! for makeup.

The CF system uses two turbine driven feedwater pumps EIIS:P! designated as A and B. Each CF pump will trip when two out of three respective CF pump suction pressure switches EIIS:PS! are in the open position (low-low suction pressure). These pressure switches are labeled 2CMPS5961, 5962, and 5963 on 2A pump and 2CMPS5971, 5972, and 5973 on 2B pump respectively. At greater than 56% Turbine EIIS:TRB! Generator EIIS:GEN! load the loss of either feedwater pump will initiate a Turbine Generator runback signal.

To prevent Unit 2 from tripping during a load rejection, valve EIIS:V! 2CM-420 must open to allow added feedwater supply flow to the remaining pump.

In the event of the loss of adequate feedwater flow to the SGs, sufficient level can not be maintained and a resultant Reactor EIIS:RCT! trip will occur.

Description of Event

On March 14, 1989 at 0412, Operations (OPS) personnel received an alarm indicating a Unit 2 Turbine Generator Runback was in progress because of 2B CFPT tripping. OPS personnel implemented the Load Rejection procedure as required. OPS personnel performed all the immediate actions required by the procedure. With the exception of valve 2CM-420 not opening, all plant systems responded in a correct manner.

The failure of valve 2CM-420 to open as required on a Turbine Generator Runback signal prevented required additional suction flow to be supplied as necessary to the remaining 2A CFPT. It should also be noted that 2C1 Heater Drain Tank Pump was out of service at this time because of a seal leak and this contributed to the loss of additional flow.

At 0413 OPS personnel noted that levels in B, and C SGs were slowly dropping. The CF Regulating valves were nearly full open and 2A CFPT was at maximum speed, but because of lack of additional supply to the SGs, levels continued to decrease. A low-low level signal was initiated from B SG causing a Reactor Trip at 0415.

OPS personnel then implemented procedure AP/2/A/5500/01, Reactor Trip Recovery, and performed all steps. All three Auxiliary Feedwater pumps automatically started and maintained SG levels.

OPS personnel made the required notification to the NRC as documented in procedure RP/0/A/5700/10, NRC Immediate Notification Requirements. At 1525, a technical review was performed and it was determined that it would be safe to return Unit 2

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to power operation. OPS personnel commenced Reactor startup at 1635 and Unit 2 returned to power operation at 2230 on March 14, 1989.

Conclusion

This event has been assigned a cause of Other, Equipment Failure/Malfunction because of the failure of 2 out of 3 suction pressure switches for 2B CFPT and a broken air supply line on valve 2CM-420.

Ruptured diaphragms in pressure switches 2CFPS5092 and 2CMPS5973 allowed water to migrate through the electrical conduit to switches 2CFPS5971, 2CMPS5971, and 2CMPS5973 causing them to fill with water and corrode the switch mechanism. These switches were all manufactured by Custom Control Sensors. Switch 2CFPS5092 is a model number 604GZM7; Switch 2CKPS5971 is a model number 6862G1; and Switch 2CMPS5973 is a model number 694GZM3. This failure caused the two out of three logic to be satisfied and 2B CFPT to trip. All three pressure switches were found to be beyond repair and were consequently replaced by Instrumentation and Electrical (IAE) personnel according to Work Request 138148. All suction and discharge pressure switches for 2B CFPT were inspected and a functional verification was performed by IAE personnel as documented on Work Request 138148.

An evaluation is currently being conducted by IAE personnel to determine if any further action is required to ensure that these switches do not experience a recurrence of this problem. The subject switches are also included in the station preventative maintenance program and will be checked for leakage during the upcoming 1989 refueling outage for both Unit 2 CFPTs. Work Requests 69154 and 69153 have been written to perform an inspection of the switches associated with both Unit 1 CFPTs by April 30, 1989. Past history of these switches shows no similar failure and scheduled preventive maintenance checks have been performed on both units.

IAE personnel found the air supply tubing for the solenoid EIIS:SOL! valve

associated with valve 2CM-420 to be broken because of vibration where the tubing entered the solenoid valve. The broken tubing prevented the solenoid valve from receiving a load rejection signal input and consequently prevented valve 2CM-420 from opening properly. The solenoid valve was replaced and the air supply tubing was repaired. The air supply tubing was placed back in the support tray and secured to prevent further damage from vibration. IAE personnel performed a functional verification and returned the valve to service as documented on Work Request 138145.

A study of the reliability of the air supplies to valves considered to be critical to operation is currently being conducted by IAE personnel. Valve 2CM-420 is one of the valves included in this study and consideration is being given to moving the solenoid valve to provide better support as well as changing the air supply tubing to provide flexible hose where the tubing enters the Solenoid. A determination will be made on these actions by July 1, 1989.

Other problems noted after the Reactor Trip were that valve 2AS-9, Main Steam (SM) to Auxiliary Steam (AS) Header Control Inlet Isolation, would not cycle and had to

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be closed manually to provide more steam supply for 2A CFPT, and valve 2SB-15, Condenser Dump Valve, cycled prematurely causing a rapid cooldown consequently causing Reactor Coolant T-ave to drop re-initiating CF isolation which had to be reset.

A review of McGuire LERs for the previous 12 months did not reveal any Reactor Trips in which the above described equipment had failed nor is there any documented history of failure. Therefore, this incident is not considered recurring.

The Post Reactor Trip Plant Response is classified as a Category A since all transient classification criteria fell within Category A (plant responses remained within preferred or expected bounds).

This event is not Nuclear Plant Reliability Data System (NPRDS) reportable.

There were no personnel injuries, radiation overexposures, or releases of radioactive material as a result of this event.

CORRECTIVE ACTIONS:

Immediate: 1) OPS personnel implemented the Load Rejection Procedure, AP/2/A/5500/03.

2) OPS personnel implemented the Reactor Trip Recovery Procedure, AP/2/A/5500/01.

Subsequent: 1) IAE personnel replaced Pressure Switches 2CFPS5092, 2CMPS5971, and 2CMPS5973 associated with 2B CFPT.

2) IAE personnel inspected all other suction and discharge pressure switches for 2B CFPT and functionally verified proper operation of the same.

3) IAE personnel replaced Solenoid Valve 2CMSV420 and repaired the air supply tubing to the solenoid valve.

4) IAE personnel inspected valve 2AS-9, greased the valve stem, and set the torque switches in the valve operator. The valve was then functionally verified and returned to service as documented on Work Request 138146.

Planned: 1) IAE personnel will inspect valve 2SB-15 as directed by Work Request 094896.

2) IAE personnel will inspect the suction and discharge pressure switches for both Unit 2 CFPTs as directed by Work Requests 095152, 095153, 094970, and 094971.

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3) IAE personnel will inspect the suction and discharge pressure switches for both Unit 1 CFPTs as directed by Work Requests 69154 and 69153.

4) An evaluation will be performed by IAE personnel to determine if any further action is required to ensure that these switches do not experience a recurrence of this problem.

5) An evaluation will be performed by IAE personnel to determine if any further problems may exist with switches of the types involved in this incident throughout all plant systems. After this evaluation, appropriate action will be taken by IAE personnel to prevent a recurrence of this or similar failures.

6) IAE personnel will determine if any actions are required to ensure that the air supply tubing to valve 2CM-420 is

sufficiently mounted to prevent damage from vibration.

7) IAE personnel will perform an evaluation of the solenoid valve associated with valve 2CM-420 and determine if any further actions are required to prevent a recurrence of this failure.

8) IAE personnel will inspect valve 1CM-420 and ensure no problem exists with the solenoid valve or air supply tubing as directed by Work Request 69164.

SAFETY ANALYSIS:

An analysis of loss of normal feedwater flow is presented in Section 15.2.7, Loss of Normal Feedwater Flow, of the Final Safety Analysis Report (FSAR). A loss of normal feedwater results in a reduction of capacity of the secondary system to remove the heat generated in the Reactor Core. The Reactor Trip on low-low SG level in any SG provides the necessary protection against a loss of normal feedwater. During this event, the CA system automatically started and was capable of removing the stored and residual (decay) heat from the Reactor, thus preventing either overpressurization of the Reactor Coolant System EHS:AB! or loss of water from the Reactor Core. Therefore, this event is bounded by the accident analysis of FSAR 15.2.7.

The unit responded to the Reactor Trip without any significant problems. All primary and secondary system parameters were at their approximate no-load value 30 minutes after the trip.

Main steam pressure did not reach the Main Steam Power Operated Relief Valve (PORV) or Main Steam Code Safety valve lift setpoints and the valves were not challenged. Reactor Coolant System pressure did not reach the Pressurizer EHS:PZR! PORV or Pressurizer Code Safety valve lift setpoints and the valves were not challenged. Adequate core cooling was maintained throughout this transient, and the Reactor

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Coolant System boundary was not challenged. Emergency power and emergency core cooling were not required in this event and were not actuated.

This event is considered to be of no significance with respect to the health and safety of the public.

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CITIZENSHIP
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April 13, 1989

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Subject: McGuire Nuclear Station Unit 2
Docket No. 50-370
Licensee Event Report 370/89-02

Gentlemen:

Pursuant to 10CFR 50.73 Sections (a) (1) and (d), attached is Licensee Event Report 370/89-02 concerning a Reactor Trip on "B" S/G Level Lo-Lo following loss of 2B CFPT because of equipment failure of 2 out of 3 suction pressure switches. This report is being submitted in accordance with 10CFR 50.72 b(2)ii and 50.73 a(2)iv. This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

Hal B. Tucker

ARS/bcb

Attachment

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